WHAT IS CLAIMED IS:

1. A wavelength converter comprising:

a first semiconductor laser for outputting light with a constant intensity and with a first wavelength forming a wavelength to be obtained when a signal light is inputted to said wavelength converter and undergoes wavelength conversion in said wavelength converter;

a first semiconductor optical amplifier for intensity-modulating the output light with said first wavelength from said first semiconductor laser through the use of the inputted signal light so that the output light falls into an opposite phase condition with respect to the inputted signal light;

a second semiconductor laser for outputting a light with a constant intensity and with a second wavelength different from that of the inputted signal light and that of the output light from said first semiconductor laser;

a second semiconductor optical amplifier for intensity-modulating the output light with said second wavelength from said second semiconductor laser through the use of the inputted signal light so that the output light falls into an opposite phase condition with respect to the inputted signal light;

a first filter for extracting a light with said second wavelength from the output light from said second

semiconductor optical amplifier;

a third semiconductor optical amplifier for intensity-modulating the output light with said first wavelength from said first semiconductor laser through the use of said light with said second wavelength extracted through said first filter so that the output light falls into an opposite phase condition with respect to said second-wavelength light;

multiplexing means for multiplexing the output lights from said first and third semiconductor optical amplifiers; and

a second filter for extracting a light with said first wavelength from a multiplexed light from said multiplexing means.

2. The wavelength converter according to claim 1, further comprising optical phase adjusting means interposed between said third semiconductor optical amplifier and said multiplexing means to adjust a phase of the output light from said third semiconductor optical amplifier for adjusting a phase difference between the output light from said first semiconductor optical amplifier and the output light from said third semiconductor optical amplifier.

3. The wavelength converter according to claim 1, further comprising an optical intensity adjusting unit interposed between said third semiconductor optical amplifier and said multiplexing means to adjust an optical intensity of the output light from said third semiconductor optical amplifier with respect to the output light from said first semiconductor optical amplifier.

4. The wavelength converter according to claim 3, further comprising:

an opto-electric converter for receiving the inputted signal light to convert the inputted signal light into an electric signal; and

a control circuit responsive to said electric signal from said opto-electric converter to monitor an average photoelectric power of the inputted signal light for controlling said optical intensity adjusting unit on the basis of said average photoelectric power of the inputted signal light for adjusting the optical intensity of the output light from said third semiconductor optical amplifier.

5. The wavelength converter according to claim 3, further comprising:

a third filter for extracting a light with said first wavelength from the output light from said first semiconductor optical amplifier;

an opto-electric converter for receiving the extracted light from said third filter to convert the extracted light into an electric signal;

a peak detection circuit for receiving the converted electric signal outputted from said opto-electric converter to detect a lower-base intensity level of the converted electric signal, and

a control circuit for receiving the lower-base intensity level of the converted electric signal to monitor a lower-base intensity level of the output light with said first wavelength from said first semiconductor optical amplifier for controlling said optical intensity adjusting unit on the basis of said lower-base intensity level of the output light with first wavelength to adjust the optical intensity of the output light from said third semiconductor optical amplifier.

6. The wavelength converter according to claim 3, further comprising:

an opto-electric converter connected to said second filter for receiving the extracted light with said first

wavelength from said second filter to convert the extracted light into an electric signal;

a peak detection circuit for receiving the converted electric signal outputted from said opto-electric converter to detect a lower-base intensity level of the converted electric signal, and

a control circuit for receiving the lower-base intensity level of the converted electric signal to monitor a lower-base intensity level of the output light with said first wavelength from said first semiconductor optical amplifier for controlling said optical intensity adjusting unit on the basis of said lower-base intensity level of the output light with first wavelength to adjust the optical intensity of the output light from said third semiconductor optical amplifier.

7. The wavelength converter according to claim 1, further comprising:

a third semiconductor laser for outputting a light with a constant intensity and with a third wavelength;

second multiplexing means connected to said third semiconductor optical amplifier and further connected to said first to third semiconductor laser for multiplexing the output lights from said first to third semiconductor lasers, with the multiplexed light with said first to

third wavelengths being inputted to said third semiconductor optical amplifier.

8. The wavelength converter according to claim 7, further comprising:

an opto-electric converter for receiving the inputted signal light to convert the inputted signal light into an electric signal; and

a control circuit responsive to said electric signal from said opto-electric converter to monitor an average photoelectric power of the inputted signal light for controlling said optical intensity adjusting unit on the basis of said average photoelectric power of the inputted signal light for adjusting the optical intensity of the output light from said third semiconductor optical amplifier.

9. The wavelength converter according to claim 7, further comprising:

a third filter for extracting a light with said first wavelength from the output light from said first semiconductor optical amplifier;

an opto-electric converter for receiving the extracted light from said third filter to convert the extracted light into an electric signal;

a peak detection circuit for receiving the converted electric signal outputted from said opto-electric converter to detect a lower-base intensity level of the converted electric signal, and

a control circuit for receiving the lower-base intensity level of the converted electric signal to monitor a lower-base intensity level of the output light with said first wavelength from said first semiconductor optical amplifier for controlling said optical intensity adjusting unit on the basis of said lower-base intensity level of the output light with first wavelength to adjust the optical intensity of the output light from said third semiconductor optical amplifier.

10. The wavelength converter according to claim 7, further comprising:

an opto-electric converter connected to said second filter for receiving the extracted light with said first wavelength from said second filter to convert the extracted light into an electric signal;

a peak detection circuit for receiving the converted electric signal outputted from said opto-electric converter to detect a lower-base intensity level of the converted electric signal, and

a control circuit for receiving the lower-base

intensity level of the converted electric signal to monitor a lower-base intensity level of the output light with said first wavelength from said first semiconductor optical amplifier for controlling said optical intensity adjusting unit on the basis of said lower-base intensity level of the output light with first wavelength to adjust the optical intensity of the output light from said third semiconductor optical amplifier.

11. The wavelength converter according to claim 1, wherein a portion of or all of the components of said wavelength converter are formed on a semiconductor substrate in an integrated condition.

12. The wavelength converter according to claim 1, wherein said first semiconductor laser is a wavelength-variable type laser.

13. An optical cross connect system comprising:

a wavelength-demultiplexing type optical filter for demultiplexing a multiplexed optical signal with a plurality of wavelengths into a plurality of optical signals each having the corresponding wavelength;

a plurality of wavelength converters connected to said wavelength-demultiplexing type optical filter for receiving said plurality of optical signals as inputted signal lights, each of said wavelength converters including:

a first wavelength-variable type semiconductor laser for outputting a light with a constant intensity and with a first wavelength forming a wavelength to be obtained when the corresponding inputted signal light undergoes wavelength conversion in this wavelength converter;

a first semiconductor optical amplifier for intensity-modulating the output light with said first wavelength from said first semiconductor laser through the use of the inputted signal light so that the output light falls into an opposite phase condition with respect to the inputted signal light;

a second semiconductor laser for outputting a light with a constant intensity and with a second wavelength different from that of the inputted signal light and that of the output light from said first semiconductor laser;

a second semiconductor optical amplifier for intensity-modulating the output light with said second wavelength from said second semiconductor laser

through the use of the inputted signal light so that the output light falls into an opposite phase condition with respect to the inputted signal light;

a first filter for extracting a light with said second wavelength from the output light from said second semiconductor optical amplifier;

a third semiconductor optical amplifier for intensity-modulating the output light with said first wavelength from said first semiconductor laser through the use of the light with said second wavelength extracted through said first filter so that the output light falls into an opposite phase condition with respect to the second-wavelength light;

multiplexing means for multiplexing the output lights from said first and third semiconductor optical amplifiers; and

a second filter for extracting a light with said first wavelength from a multiplexed light from said multiplexing means; and

an optical coupler for multiplexing the extracted lights outputted from of said second filters of said plurality of wavelength converters.